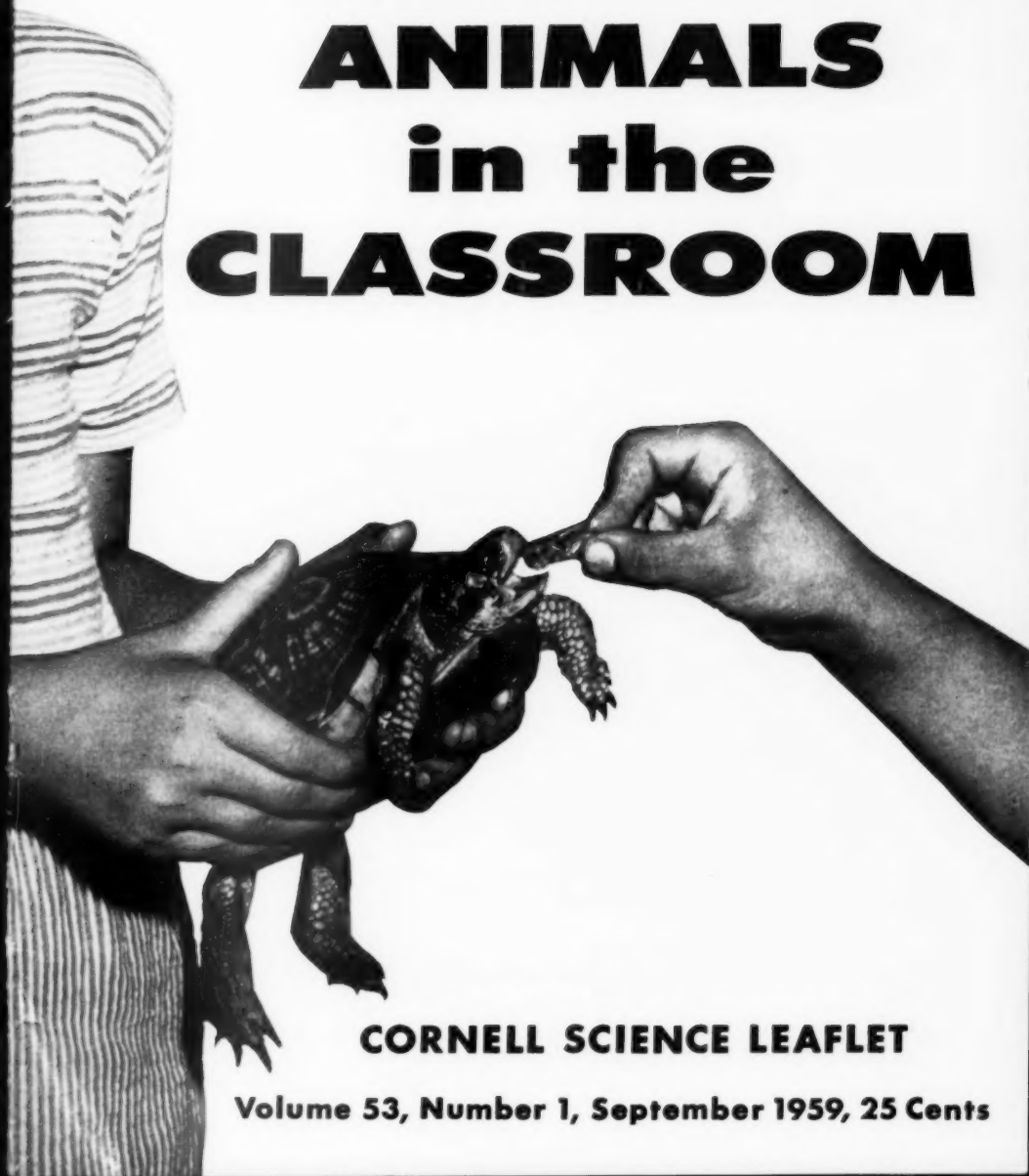


KEEPING ANIMALS in the CLASSROOM



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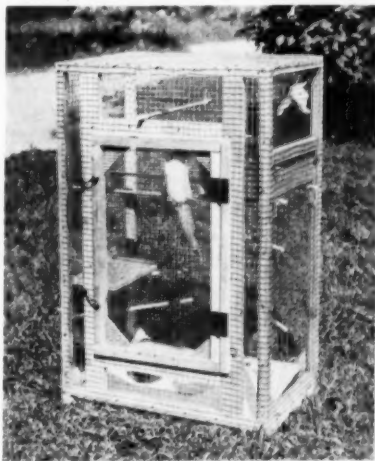
Verne N. Rockcastle

Louis Agassiz, the great scientist, is reported to have said "Study Nature, not books." It was his firm belief that although reading about living things is good, direct observation of the living thing is better. It is not always possible to take elementary school pupils to see an animal in its natural surroundings. Many kinds of animals can be brought into the classroom, however, and there they can be studied in some detail. This leaflet suggests ways to help you keep living animals in your classroom.

When living animals are brought into the classroom, they should not be kept so long that they become a chore and a nuisance. When the children have had ample opportunity to see an animal, study the way it eats and acts, and perhaps learn some facts about its life cycle, then it should be released at or near the place it was found.

Mammals and birds should not be caged for long periods of time unless they are of a domesticated variety. A canary, a parakeet, or a white mouse, may be kept in a

classroom for several weeks or longer. A few wild animals such as the white-footed mouse and the flying squirrel, though naturally wild, soon become accustomed to cage life and may be kept for several months if properly fed, watered, and given sufficient room and shelter in a cage that is kept free of debris. Larger mammals such as a



This flying-squirrel cage is fitted with several perches, a nesting box and a removable bottom to facilitate cleaning. Cost to make: about \$6.00.

raccoon or an opossum are best kept for a day or two so that children can see and study them, then released or returned to an owner who can care for them properly. Remember to check first with a Conservation Department official to see if it is legal to keep a large mammal caged.

Some animals can be kept in a classroom until they produce young. Mice, for example, may be expected to produce a litter at least three or four times a year. After the young are mature enough to take care of themselves, the parents or the young may be released. Some small animals such as flour beetles, may be kept indefinitely, and the young used to feed larger animals that need animal matter in their diet. Lizards, for example, will subsist on a diet of mealworms raised throughout the winter months.

Many animals that can be raised successfully in a classroom are small, take up little space, and require a minimum of care. Among these are some insects, earthworms, tropical fish, amphibians, a few snakes, and some small aquatic animals such as crayfish, water sow bugs, flatworms, and Hydra. Many of these animals can be kept in small jars, wide-mouthed gallon jars, or in small wood-and-wire cages. Whenever possible, each child should be allowed to raise a small animal for himself. A large measure of pride and interest may result from individually owned and

cared-for animals compared with an animal raised by the group.

Cage construction

For the lower grades, use the simplest cages. A simple cage for insects and other small invertebrates can be made from a piece of gauze or netting, a pint jar, and a jar ring. In this cage you can keep mealworms, ants, gall insects, vinegar flies or fruit flies, small spiders, or even mosquito wigglers. Details for raising each of these animals can be found on the pages that follow.

Cages for all rodents should be made of wire mesh, or of wood or cardboard lined with hardware cloth. Animals with gnawing teeth can escape quickly from cages that are not lined with wire or metal.

Cages for birds such as house sparrows should be large—as much as two to three feet square and at least two feet high. Most birds, except house pets, need ample room for exercise.

The bottoms of all large animal cages should be of hardware cloth that is coarse enough to permit the animal's waste and feeding debris to fall through. If a newspaper is kept under the cage, soiled paper can be replaced without opening the cage. An accumulation of droppings and soiled food in the cage may sometimes cause disease among the caged animals. Clean cages mean healthy animals. Clean cages also reduce animal odors in the classroom.

LARGE MAMMALS

To keep a large mammal in the classroom, you must either have a large cage, or keep the animal securely chained. Children sometimes like to bring a pet raccoon, skunk, opossum, or baby fox to school. Even pets may scratch or bite a child without intent to harm, so it is wise to keep them confined while they are being observed in the classroom.

Animals such as the raccoon and skunk are nocturnal in nature. During the day they may sleep in a den box provided at one end of the cage. A cage for these mammals must be about three to four feet square, and high enough to permit the animal to exercise freely. The bottom of the cage should be made of coarse wire mesh so that debris can drop through onto a paper or a pan that can be removed for cleaning without opening the cage. Fresh water is important and a dish of it should be available at all times. It is best to attach a dish to one side of the cage so that it will not spill. Suggested foods for the common mammals that children are likely to bring to the classroom are meat scraps, vegetables, fruits and berries.

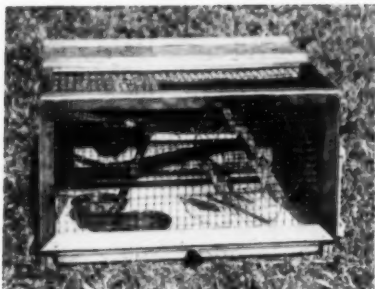
When a large mammal has served its purpose in the classroom, see that it is taken home or released. Not only may there be an unpleasant odor if the animal is kept too long, but they need daily care, even over weekends and vacation

periods. It is best to study the animal carefully between Monday and Friday, then see that it has left the room before Saturday comes. It is not kind to keep a large animal caged without fresh water and food over a weekend. Remember that you can teach children kindness and tidiness at the same time you are teaching them about the animals themselves.

MICE

Of all the mammals that you can keep in a classroom, perhaps none is better suited to cage life than the mouse. There are many kinds of mice that may be kept in a classroom and studied by the children. Some of the common ones are white mice, house mice, white-footed mice or deer mice, and meadow mice. Of all these, white-footed or deer mice are best. They have little or no odor, will eat a wide variety of foods, can live comfortably in a rather small cage, and can be released at any time of the year. They reproduce rapidly, so keep mature females and males in separate cages unless you wish to raise mice.

A satisfactory mouse cage can be made from one-fourth inch mesh hardware cloth covering a wooden frame about 18 inches long, 10 inches high, and 10 inches wide. In one end place a small cardboard or wooden box about four inches square and four inches high to serve as a den. Nocturnal mice will spend many of the daylight hours here.



This mouse cage has a snug retreat in one corner and an exercise wheel that is used frequently. The removable tray at the bottom facilitates cleaning.

Keep a small water dish in one corner of the cage, and fill it daily with clean water, or attach a water bottle to the side of the cage. The food of the whitefoot mouse may consist of bits of unsalted nuts, apple, peanut butter, meat, bread, and vegetables. You may wish to construct an exercise wheel in the cage for the mouse to run on when it wishes.

Meadow mice are not so tolerant of other mice as are white-footed mice. In fact, they may eat other meadow mice if the cage becomes crowded. They eat apple slices, apple bark, bits of lettuce, celery, potato, and other vegetables. Their teeth are longer and stronger than those of the white-footed mouse, so be careful that neither you nor the children put your fingers where they can be bitten.

White mice are easily kept in a cage similar to those above. However, they do have a slightly dis-

agreeable odor, so care should be taken to keep their cage as clean as possible. White mice are a mutation (white) of the house mouse. Whatever directions hold for them will also hold for the smoky-brown house mouse.

All mice have gnawing teeth. Their incisors constantly grow and must be worn down by gnawing to keep them short and sharp. When you give nuts to a small rodent, do not shuck them. Let the creature sharpen its teeth by gnawing out the nutmeat for himself.

General appearance and habits of an animal can be studied while it is caged, but the tracks of a confined animal cannot be studied easily. To study the tracks of a small rodent, place a glass plate in front of the cage when you are about to release the animal. Surround the plate with sheets of white paper. Ink the plate with a bit of printer's ink as you would to make leaf prints. When the animal leaves the cage, it will run across the inked plate, then across the paper. There it will leave a permanent track for all the pupils to see and study.

BATS

Some day a child may bring in a bat, or you may find where to get one. A live bat is well worth having in the classroom, even for just a day, to allow the children to study its wings, the tiny claws at the tips of its fingers, the way it flies, and how it eats. Most bats are difficult to

keep and feed for long periods of time. Occasionally one will be quite cooperative, and will take insects and bits of meat from the fingers. At other times they are almost impossible to feed. However, if kept in a cool, dark place, a live bat will stay in good condition for two or three days and the class can have a chance to see it fly around the room. Fasten some wires or string across the room at various angles, then darken the room and watch the bat successfully navigate through the darkened room without striking the obstacles.

Contrary to popular belief, bats are not lousy, they do not fly into human hair and snarl it, they are not vicious, and they are not mice with wings. Occasionally a bat carries rabies, but so do cats, dogs, and several other mammals. Bats' teeth are short, but sharp. They are accustomed to biting into the hard shells of flying insects. However, they are seldom long enough to inflict injury through a medium weight leather glove.

If you can get a live bat (the little brown bat and the big brown bat are the ones most commonly brought into the classrooms of the northeast), give the children an opportunity to see its silky fur, the membranes between its fingers and the membrane connecting its hind legs and tail. Let them count the fingers to see how they correspond to our hands. Notice the teeth. Are they like those of a mouse or a rabbit? Are they more nearly like those

of a cat? Does a bat have eyes? Does it have ears? Does it produce any audible sounds? How does it move on a vertical screen or on a drape?

Once you have examined a live bat and have watched it fly around the room, release it. Remember that these are insectivorous creatures that help to control insects, and at the same time do little or no harm to the humans who fear them.

BIRDS

Except for domesticated species few birds can be kept in the classroom. It is illegal to confine almost any songbird except the English sparrow, starling, pigeon and crow. Remember, too, that baby birds nearly always receive better care from their parents than from humans.

If you do wish to keep a wild bird captive, however, there are some precautions that you should take. Wild birds are apt to be extremely nervous when first caged. To calm them down, keep them in a small darkened cage. In dim light birds are less active than in bright light. After a few days in dim light they can be allowed more light and a larger cage.

A cage for birds should be roomy, made of fine wire screen so they cannot push their bills through and injure their tender skin. The cage should be fitted with dishes for water and food, and with perches to get the birds off the floor of the cage. A coarse screen bottom that

will let droppings fall through can rest upon a newspaper that can be removed and replaced with clean paper daily.

Seed-eating birds such as the sparrow must have grit mixed with the feed so the gizzard can have material to use in grinding. They like fine gravel or bits of oyster shell added to grains such as cracked corn, millet, oats and weed seeds. Canaries and parakeets may be fed commercial food made especially for them.

Birds are sensitive to drafts when kept indoors, so make sure your cage is placed where the birds are free from them. After you have studied the birds for a sufficient time, release them or take them to another room for more children to study. Do not keep any animal so long that it becomes uninteresting or becomes a chore to feed and clean. Keep the parade of small animals moving and varied.

SNAKES

Snakes are one of the easiest and cleanest animals you can keep in a classroom. Occasionally, however, a snake refuses to eat in captivity. If one has not eaten for two or three weeks, it should be released near the place where it was captured, or in a similar habitat. Do not release snakes just anywhere. Persons who dislike them may kill them, they may not be able to find food to which they are accustomed, or in cold weather they may not be able



This simple snake cage has a glass front, a screened portion in back, and a hinged cover for cleaning and feeding.

to find a suitable hibernating place.

A snake cage is simple to make. You can use almost any smooth-sided box no shorter than three-fourths the length of the snake. In width and height it should measure no less than half the length of the snake. Hinge the top or remove it in order to put in food and water, and to replace the paper on the cage bottom when it becomes soiled. Screen the top or one side to provide good ventilation. A terrarium or an empty aquarium with a screened cover makes a suitable snake cage.

In the bottom of your snake cage keep a newspaper or some pine needles or wood shavings. A newspaper bottom can be replaced every few days. In one corner of the cage keep a dish of fresh water. This should be large enough for the snake to coil in if necessary. Some snakes such as the water snake (there are no water moccasins in New York State!), the garter snake

and the ribbon snake may spend hours coiled up in the water dish, particularly before shedding their skins! On the cage bottom there should also be a large stone or a rough piece of wood or tree branch against which the snake can rub its skin when it begins to shed. Some snakes like to climb on branches, so it is a good idea to provide at least one sloping stick in a snake cage.

Many snakes eat only one meal every few days, but this may be a big one. A milk snake, for example, may eat a mouse one day and then nothing for a week or more. A garter snake may eat several earthworms one day, and none for three or four days. The foods that the common snakes of New York State eat are listed in the following table:

Garter snake—earthworms, tadpoles, frogs, grasshoppers

Ribbon snake—small frogs, salamanders, small fishes (in captivity)

deKay's snake—slugs, snails and earthworms

Milk snake—small mice, (field mice for adults)

Water snake—fish, tadpoles, frogs and salamanders

Red-bellied snake—slugs, earthworms

Rough green snake—caterpillars, crickets, spiders

Smooth green snake—crickets, grasshoppers, small moths, spiders

Ring-necked snake—Earthworms, small salamanders, some insects

Hog-nosed snake—toads

King snake—other snakes, mice, some frogs and toads

Pilot black snake—mice, occasionally frogs and other snakes

Black snake—mice, insects, frogs and toads

You should never keep a poisonous snake in a classroom. You may never find one anyway, since there are far more non-poisonous snakes in the northeastern states than there are poisonous ones. In most of New York State there are no poisonous snakes at all. In only a few isolated sections of central New York, in some of the southern tier counties, and in southeastern New York are there any snakes that you cannot safely keep in a cage.

Snakes need warmth to move about. When they become chilled, their movements are slow. If you wish to take pictures of your snakes, you can slow their movements by first placing them in a paper bag in the refrigerator. Do not place them too close to the freezing compartment, or you might lower their temperature too much. When they have been in a cold place for a half-hour, remove them. While they are cold they usually will seek a warm place such as a sunny spot and stay there until their bodies begin to warm up.

Just before a snake sheds its skin, its eyes will turn milky-blue. Then it may become nervous and refuse food. If it has water and something to rub against, a snake will shed its skin in one piece and you may have



This lizard cage, a screen-topped discarded aquarium, is placed near a window where the animals can sun themselves.

Lizards drink water with their tongues, but usually they drink very little. Many lizards get most of their water from their food. To provide water, sprinkle a little on the slab of bark daily, or over the leaves and stones in the bottom of the cage. You can even drop in a piece of lettuce and sprinkle it with a few drops of water.

Eastern lizards usually will eat small, soft-bodied insects such as crickets, grasshoppers (small ones), beetle larvae, small moths, and flies. Desert lizards will eat small soft-bodied insects and sometimes plant materials as well. Some desert forms will even eat dandelion blossoms. Don't try to force a diet of these, however. Occasional plant materials such as small pieces of fruit or banana, together with animal material will provide a balanced diet.

Horned lizards, in spite of their appealing horny nature, are sometimes difficult to feed. They will eat ants with relish if they will eat at all. However, native lizards are always better to keep, since you can release them if you are unsuccessful in caring for them.

Use the lizards in your classroom to show reptilian features, and at the same time to show the differences between lizards and snakes, or between lizards and salamanders. Remember that lizards may be thought of as snakes with legs and (usually) with eyelids and ears. Snakes stare because they have no eyelids to blink, not because they are "charming" something. Many lizards, on the other hand, have eyelids that blink like yours and mine. After a lizard that is only asleep on the slab of bark or on a

it as a specimen. The skin is shed by turning it inside-out. Look at the scale pattern on a newly shed skin, and at the eye coverings. Can you see why a snake cannot blink its eyes? Glassy-hard scales cover its eyes. The scales may get dusty, but crawling through the grass keeps them clean.

Most snakes will eat only live food. One, the king snake, is a powerful constrictor, and often wraps its coils around a meadow mouse to subdue it before it begins eating. Because its prey cannot breathe in the coils, it soon suffocates. When snakes are in the process of eating, they may be shy, so do not disturb the snake by quick, nearby movements. Until the snake becomes accustomed to an audience, let your class stand at a distance to observe its eating.

Earthworms can be fed to garter snakes by means of long forceps or they can be dangled by the fingers in front of the snake. They can even be dropped into the cage near the snake. If the snake is hungry, it will soon seize one end of the worm in its jaws and proceed to "walk" its mouth over the food.

A snake's teeth are short and sharp, and project backwards. The jaws are loosely connected to each other by muscles and ligaments, and each jaw permits a slight movement at the front also. By a series of chewing movements from side to side, and by simultaneous swallowing actions, the snake is able to

stretch its jaws apart and literally pull itself over its food. The process is fascinating to watch.

In spite of some teachers' feelings of revulsion as they watch a snake move or eat, it should be remembered that snakes are generally good to have around. They eat untold quantities of insects, mice and rats, and slugs that damage garden plants. They are not slimy, they do not charm birds, and most of them quickly flee at the approach of a human. Try to keep a few of them in your classroom for the pupils to study. Learn to appreciate them for the good that they do, and the interesting creatures that they are, then release them before they become uninteresting to the class. In this way, snakes can be a source of immense interest and information.

LIZARDS

A dry terrarium is a suitable cage because most lizards like dry, warm surroundings. To make such a cage, put a half inch of mixed leaves or pine needles in the bottom of a terrarium. Place a slab of bark on top of this so the lizards can sun themselves on top of it, or hide under it. This sort of a terrarium will be suitable for most eastern lizards such as the coal skink and the fence lizard. If you wish to keep a horned lizard ("horned toad") or some other desert form, then you may keep sand in the bottom of the terrarium and a stone or a slab of bark in one corner.

yours. As with other animals, turtles should be released if they are native to your area and are of no further use in your school.

FROGS, TOADS, AND SALAMANDERS

Amphibians are excellent vertebrate animals to keep in the classroom. Their development from egg to adult is rapid; they are easy to collect; they are abundant throughout most of the eastern United States, and they are easy to feed and maintain. Several kinds of frogs can be kept in a classroom terrarium, but only a few adjust well to terrarium life of more than a few days.

Peepers and other tree frogs are small and less active in a terrarium than are the meadow frog, the green

frog and the bullfrog. Peepers can be collected most easily in early spring when they sing both night and day along the edges of ponds and marshes. In the evening, patient collectors can spot one in a flashlight beam, clap a hand over it, and put it into a large jar for transporting to the classroom. The peeper will soon make itself at home in a terrarium of moss and other small plants. Feed it small flies and other soft-bodied insects or small worms. By late fall, however, it should be released, since some hibernating animals such as the peeper do not do well indoors in winter. Also, getting natural food for small frogs may be a problem in winter.

The toad grows rapidly from egg to adult in the classroom. Eggs can be collected in early spring when they are laid in shallow ponds and roadside ditches. Toads lay their eggs in strings like tiny black beads in contrast to the clumps or masses of frogs' and salamanders' eggs. A few toad eggs placed in a shallow pan of pond water will produce larvae in a few days' time. Toad tadpoles are tiny, black, and active. They feed on plant material such as algae. Boiled lettuce, and especially the inner, spongy portion of *Sedum* leaves make excellent food in the classroom. Add fresh pond water from time to time to replace the pan water that evaporates.

When a toad tadpole's back legs are well developed, place some flat



Six pieces of single-strength window glass were taped together to make this simple terrarium. In it live a peeper and several small salamanders. Their food consists of small insects dropped in occasionally.

stone will seem to be lifeless because its eyes are closed. However, it will jump into action quickly at sounds that snakes cannot hear and can roll its eyes to watch for movements.

All lizards lay eggs, and you may be successful in raising the young in captivity if you give the lizards some privacy for their nest. A large terrarium with a good bed of pine needles or leaves, and a slab or two of bark under which to hide the nest, may produce several young from the sparrow-sized, leathery eggs that the female may lay after mating.

Remember that lizards like warmth. Do not try to keep them in a cold place, or they will fare badly. If you have them in a cool corner of the room, place a goose-neck lamp over the terrarium so that they have some artificial sunlight. You can cover the terrarium with a screen, yet the heat of the lamp will still warm the cage. Food, water, warmth and a place to hide will help to keep your lizards in good condition.

TURTLES

Most turtles do not need a watery cage. Ideally, a turtle cage should have a gravelly or rocky area at one end for sunning, and a pool at the other end for drinking and bathing. However, turtles quickly foul the water in a pool, so a dry cage often proves more practical in the classroom.

If you wish to keep turtles for only a short time, you can use an empty aquarium tank with newspaper on the bottom. There should be some kind of shelter in the tank for the turtle to hide under at least part of the day. Each day remove the turtles from the cage and give them a good soaking for an hour or more in a pan of water or in a sink. Many turtles may even prefer to eat under water, and will use this soaking time for eating.

Box turtles, wood turtles and other land forms eat both plant and animal material. You can feed them earthworms, soft-bodied insects, pieces of meat including liver, slices of apple, banana, and berries, and pieces of lettuce and other leafy vegetables. Remove the uneaten food from the cage or from the water so that it does not foul the cage.

Turtles such as the painted turtle, wood turtle, snapping turtle, and soft-shelled turtle are primarily meat-eaters. They relish earthworms, bits of meat, tadpoles, and occasional insects. Try feeding them under water if they decline to eat in a dry cage. As with all other animals in your classroom, remember to remove uneaten food before it spoils in the cage.

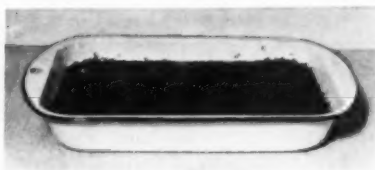
Given proper care, turtles will live a long time in a classroom. Some small turtles may live to be older than you. They require little care, take up little space in a classroom, and can be traded for animals from another classroom when they have served their purpose and

stones or a sloping board in the pan so it can leave the water when its front legs and lungs develop. At this time the pan should be placed in a large carton or in a screened container or the young toads may hop out of the pan and disappear in the room.

Soon after young toads leave the water they should be released near a pond or placed in a roomy terrarium containing moss and other small plants and an abundance of tiny insects. Sweeping an insect net back and forth close to the grass may provide sufficient small insect life to feed the toads until school is out. Then they can be released.

Adults toads need only a roomy terrarium containing loose, moist soil and some moss or stones. Feed them earthworms and soft-bodied insects, but do not overfeed them or they soon become very fat from inactivity.

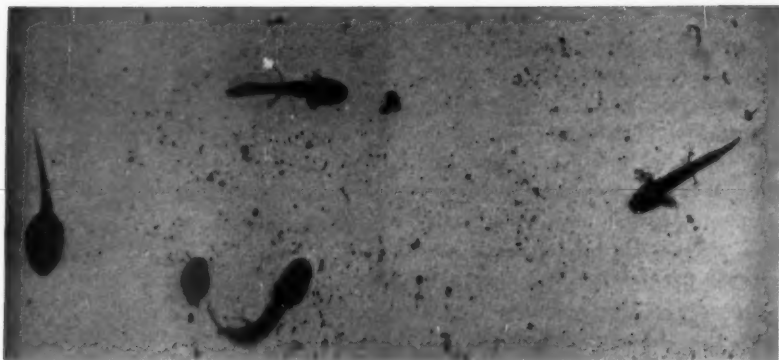
Do not try to raise large tadpoles that pupils bring into the classroom in the spring. They may be green frog or bullfrog tadpoles, both of which require at least a year to mature. Bullfrog tadpoles require two winters as tadpoles before they become adults. Children often wait in vain for a whole school year for a large tadpole to become a frog, only to learn that they had a bullfrog tadpole that would not become an adult until mid- or late summer at the earliest. By contrast, toad tadpoles (small and nearly black) mature rapidly, and even as adults they adapt well to life in a terrarium.



Under the cover of duckweed in this shallow pan live several salamanders and tadpoles—all raised from eggs collected in early spring.

Salamanders, especially the spotted and Jefferson's salamanders, are worth raising from eggs. In early spring these salamanders lay eggs in jelly-like clusters of 6 to 20 fastened to twigs and other debris in shallow, woodsy ponds. If you find such a mass of eggs, place it in a shallow pan of pond water like that shown above. Keep the pan of water in a cool, but well lighted place. Do not cover the pan. After the larvae have emerged, replace the water in the pan with fresh pond water every few days for two or three weeks. The larvae will live on the tiny animals in the pond water until they are large enough to take small bits of earthworm or pieces of ground beef. Soft bodied insects such as mosquitoes are excellent food when the larvae are about an inch long. They are especially fond of mosquito wigglers and greedily devour numbers of them.

These salamanders seldom metamorphose (change to adults) before school is out. By June, however, they will be two or three inches long, their gills will be large and easily studied, and both front and back legs will be well developed.



Under the duckweed cover live several salamander tadpoles and a frog tadpole. They are growing steadily and seem quite happy in this simple cage.

If you succeed in raising a few salamander larvae in your classroom, be sure to show your class the circulation of blood through the gill of one of them. To anesthetize a salamander, add a few crystals of chlorotone (you may need a prescription to get this, even though it was once a common treatment for colds) to a small dish of water, put a larva in the dish, and wait until it no longer reacts to touch. Then remove the animal, put it into a dish of fresh water, place it under a low-power microscope, and focus on the gill filaments. If you watch carefully, you can see the blood corpuscles go racing through the little arteries, literally squirt into the capillaries, regroup in tiny veins, and go racing away toward the heart—carrying a fresh supply of oxygen back to the needy tissues. To see real blood circulating is an experience children will long remember.

You can keep adult salamanders such as the red-backed salamander, the dusky salamander, and the newt in a mossy terrarium containing a piece of bark or a few small flat stones under which the animals can seek shelter. Provide your amphibians with small insects and earthworms every few days and they will live comfortably for weeks with little or no extra care. For ease of capture and maintenance, as well as interest for youngsters, salamanders offer much for the teacher who wants to keep living animals in her classroom.

FISH

When keeping fish in a classroom, remember two things: (1) a healthy aquarium is one that is not crowded; each inch of fish requires about a gallon of water; (2) more fish die from overeating than from almost any other cause. To find out how

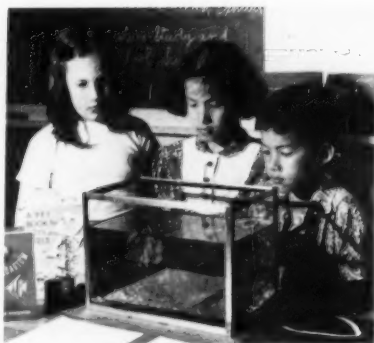
many fish, and how big, you can keep, multiply the length by the width of your tank, then by the depth of the water in it. Divide this total by 200 and you will know how many inches of fish you can keep. Of course this is an optimum figure, and can be modified slightly, but it should not be departed from to any great degree.

There are many books and pamphlets that show directions for making a good aquarium, so detailed directions will not be given here. A few things to remember, however, are:

1. Cover the bottom with an inch of clean, fine gravel.
2. Plant a few water plants in the gravel.
3. Slowly add water to the desired depth.
4. Let the tank stand for a day before adding fish.
5. Cover the aquarium with a glass cover to slow evaporation.
6. Keep the aquarium out of direct sunlight. This helps to keep the temperature from soaring, and the algae from growing out of control.

To stock the aquarium, it is best to use fishes that will get along with each other. Some tropical fishes that are inexpensive and will live in a community tank are:

<i>Live bearers</i>	<i>Egg layers</i>
Guppies	Neon tetras
Swordtails	Dwarf barbs
Platies	Dwarf catfish



A five-gallon aquarium such as this can serve as a community tank for several species of tropical fish, or for some native minnows.

These are all small fishes, and several of them can be kept in a five-gallon tank. Larger tanks can, of course, accommodate proportionately larger fishes.

Guppies are prolific fish. One pair will produce many offspring in the course of a few months, providing all the children in the class with some tropical fish of their own. In addition, guppies are hardy fish, not susceptible to temperature changes as are most tropical fish that need a water temperature of about 70° F. Feed the fish a pinch of tropical fish food daily, but not more than they will clean up in ten minutes. A few snails will help to finish what the fish do not eat.

If you have an extra tank, or wish to sacrifice a community tank for the purpose of watching a single species, the Betta or Siamese fighting fish makes a fascinating addition to a classroom. These fish are

bubble nest builders. The male blows a bubble nest at the top of the aquarium, then literally spits into the nest the eggs that he has collected in his mouth. The male is an aggressive fish, so it is unwise to keep other fish in the same tank.

At the end of the school year, or even during vacation time, it may be wise to "farm out" the fish with one of the children who will take good care of them and keep them where the water will not become cooled.

A community tank of tropical fish can be a source of immense pleasure and interest for an elementary classroom. Once established, a routine can be set up to make maintenance regular and simple. Some well-established community tanks are seldom disturbed from one semester to the next except to feed the fish. As with other animals, however, do not try to keep an aquarium beyond its period of usefulness. When the children begin to tire of it, trade with another teacher, then bring it back into your room when you have a new class. In this way you will always keep new and different animals in your room, and other children in other rooms will benefit from the animals that you trade.

NATIVE FISH

Tropical fish are not the only ones that can be kept in a classroom. Many native minnows make

good aquarium pets. One of the most common in New York State is the black-nosed dace. This minnow lives in streams, but seems to thrive in an aquarium. It grows to a length of about two to three inches, has a black stripe running around its nose and along its sides. It can be netted from small streams with a kitchen strainer. Small sunfish, bullheads (catfish), and shiners also make suitable aquarium pets. They can be fed fish food plus bits of earthworm, and pond dippings. It is a good idea to check with local Conservation Department officials before netting minnows from any stream.

If an aquarium begins to "green up" from algae growing on the sides, treat it by first scraping off the algae, then by setting the aquarium where it gets less light. Do not feel that the aquatic plants need to get plenty of sunlight, because they add little oxygen to the water. Most of the oxygen needed by the fish comes in through the surface of the water. The plants aid more in protection of the young, and for the general appearance of the aquarium than they do for oxygen production.

INSECTS

Insect collections are fun for children to make, and with them much can be learned about insects' appearance. Insects' habits, however, are best learned from live insects—not dead ones on pins in boxes. There are a number of things to

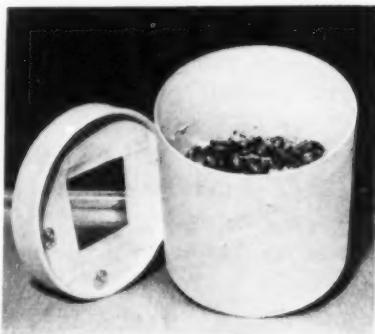
learn from living insects in the classroom, and few of these require expensive or elaborate equipment.

The life cycle of some insects—from egg to egg—can be studied in a bottle. Fruit flies are abundant in autumn. If a few grapes or some banana slices are placed in the bottom of an uncovered pint jar, it will not be long before several fruit flies will gather inside the jar. When a half dozen or more have collected, place a piece of cheesecloth over the opening and screw on a cover (ring type). In this jar you can now observe the entire life cycle of the fruit fly. If you have attracted both males and females, the adults will probably mate and lay eggs in the jar. These may be too small for you to see, but soon the eggs will hatch into tiny larvae that you can watch feeding along the edge of the fruit. After eating and growing to a length of about one-fourth inch, the larvae will crawl up the side of the glass or onto a piece of crumpled paper placed in the jar and pupate. The pupae are oval, cream-colored and do not move. After about five days each pupal case will split and an adult fruit fly will emerge. From adult to adult takes about two weeks—and it all happens in a pint jar.

Many scientists use the fruit fly for experiments in genetics (the science of heredity). When they wish to keep several generations of fruit flies, they prepare a special food from corn meal, yeast, and molasses. This is poured into the bot-

tom of the jar, a crumpled piece of paper is placed on top of the food, and the fruit flies placed inside. In jars of this sort the flies may be raised all year long. Perhaps some of your pupils will wish to conduct experiments with fruit flies, separating males and females with particular characteristics and placing them in fresh jars to mate. Records kept of the offspring and their characteristics can be excellent sources of information about heredity.

Another insect that can be raised easily in the classroom is the mealworm, a kind of beetle. Mealworms can be purchased from a number of sources, some of which are indicated at the end of this Leaflet. The larvae are cream-colored, with dark heads and six legs. They need only a very simple cage—a large glass jar, an oatmeal container, or a small terrarium. In a wide-mouth gallon



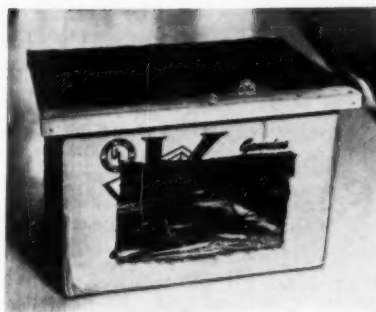
This two-quart container is home for dozens of mealworms. They provide food for many small animals in the classroom. Their own food is oatmeal and bran flakes.

jar put about an inch of oatmeal flakes and anywhere from a few to a hundred or more mealworms. Cover the flakes with a piece of paper toweling, sprinkle it occasionally with a few drops of water, and put a screened lid in place. The mealworms will feed on the meal for the most part, but may be given several apple slices from time to time. As the apple slices are eaten or dry out, replace them with fresh slices. These not only provide food, but also water for the larvae.

When the mealworms pupate, they form mummy-shaped objects complete with wing covers, legs, and indications of mouthparts. The pupae are creamy white. They remain that way for about 20 days, then emerge as creamy beetles. Oddly enough, the beetles do not remain white, but soon change to dark brown, then black. This color change occurs in about two to three days. Adult mealworm beetles are black in color and about three-fourths inch long. Adults left in the cage will mate, lay eggs (tiny ones again) and keep the culture going if you are careful to provide food and moisture for them.

Mealworms make excellent winter food for animals such as lizards, some snakes, turtles, and even some mice; they have even been used to feed dragonfly nymphs and toads.

A second kind of mealworm whose scientific name is *Tribolium confusum* is smaller and more slender than the mealworm. It lives in grains, cereals, and may even eat



This grasshopper cage was made by a third-grader, using a cardboard box, a cellophane window, and a window-screen top. In it is soil, grass and a water dish.

pepper! You can keep these beetle larvae in cereals such as bran flakes, if you remember to add moisture in the form of apple slices occasionally. These smaller larvae are good food for small lizards and snakes.

Crickets can be kept throughout the winter in a terrarium that contains about an inch of excelsior, a jar with water, and a low dish such



Mrs. Foster's second-grade pupils kept crickets and grasshoppers in their own cages. Their records included drawings and descriptions of life histories.

as a Petri dish with food. Crickets will eat dog food mixed with a little water to keep it moist, crumbs, or other table scraps. Like most other insects, crickets need water occasionally; remember to sprinkle a little water over the excelsior daily.

These three insects—mealworms, flour beetles, and crickets—will provide food for some other animals living in your classroom. There are many insects, however, that may be kept in the classroom just for their interesting habits, and for illustrating certain biological principles. Plant galls, for example, may be kept in a simple cage made from a nine by sixteen inch piece of window screen and a coffee can. Roll the screen into a cylinder nine inches long and set it into a coffee can. Staple the cylinder at the midpoint, adjust it so that it fits snugly in the can, then remove it and staple the bottom. Replace it in the can, place the can lid on top, adjust the cylinder again, and staple the top. The finished cage (at right) will do for many insects in the classroom.

In mid-winter, or in early spring, gather a number of goldenrod galls, willow cone galls or raspberry galls, and put them into cages like the one described above, which you can even hang out of doors. Galls (and cocoons, too) need moisture to keep from drying out. Sprinkle your galls occasionally, or let the rain splash on them so the pupae inside do not dry out. By mid-spring some



This simple cage will keep many insect pets. It's weatherproof, too.

flies or wasps will have emerged from the galls. By keeping close watch on a number of the galls, you may be able to see one of the gall insects in the process of emerging. Can you see the little bubble-like structure with which the gall fly bursts through the skin of the goldenrod gall? Few persons have seen it. Your cage and the insects you keep in it will enable you to watch a number of these interesting developments.

In September you can use the same cage to keep one or more monarch caterpillars while they change from caterpillars to butterflies. Col-

lect the caterpillars from milkweed plants in September and put them in a coffee-can cage. Each day put some *fresh* milkweed leaves in the can for the caterpillars to eat. When a caterpillar no longer shows any interest in the fresh leaves, watch carefully. You may see it spin a button of silk, grasp it with the hind pair of pro-legs, and hang head downward. In about 24 hours the larva will split its skin, shed it and become a brilliant green pupa with gold dots. In about ten days it will become dark purple, then black and brown. This means that in another 24 hours it will emerge as a monarch butterfly. If your class has several of these in the room, the children may be lucky enough to see the butterfly emerge. Then they will *know* that the monarch butterfly does not over-winter as a pupa, as one well-known elementary science textbook implies.

By experimenting with your coffee-can cage you may find a number of interesting animals that can be kept for a few days to a few months for observation. Living insects are often much more fascinating than dead ones. And children watching the living insects are much less apt to fear them later, knowing that they are both harmless and interesting.

Two insects that need no cage at all, but can be kept on a desk by means of a miniature moat are the lacewing and lady beetle larvae. These tiny insects may be found on



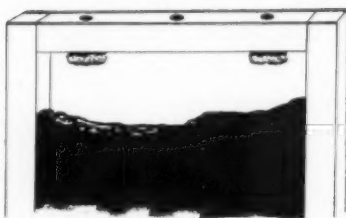
One of the simplest of cages—an aphid-covered plant in a one-holed stopper. The can-lid contains water for the plant and prevents the escape of the aphids.

goldenrod, or aster, or wild lettuce, or a number of other plants harboring aphids. The tiny aphid lion with its long, sickle-shaped jaws, seizes an aphid, sucks the juice out of its body, then tosses the shriveled skin away. If you can find one of these creatures, carefully pick the stem, carry it to the classroom, and put it in the hold of a one-holed rubber stopper. Place the stopper in a shallow jar filled with water. This will help to keep the stem fresh, and will keep the larva from leaving it. Occasionally re-

place the stem with a fresh one holding several aphids. If you are lucky, your aphid lion will pupate on the stem, and will emerge as a lacewing.

The ant is another insect that can be kept in the classroom. An ant farm or ant house can be made from two pieces of eight by ten inch single-strength glass and four wooden strips one-half inch square. Cut two of the strips eight inches long and the other two nine inches long. In one of the longer ones drill three quarter-inch holes. Nail the three undrilled pieces together to make a U-shaped frame. Using wide adhesive tape, fasten the glass to the sides of the frame to make a glass-sided house with an opening across the top. This opening is for the fourth piece of wood. Before putting it in place, fasten a piece of sponge under two of the holes, and a piece of screen over the third hole. A tack will hold the screen in place and yet permit it to be moved to one side to insert bits of dead animal material for the ants to feed on.

You are now ready to gather ants for the ant nest. Find an ant hill in a field nearby, then dig into it with a trowel until you have uncovered a group of ants. Put some of them and some soil from the ant-hill into a quart jar, close it, and take it home. Try to include a queen ant if you can find one. You can identify her by her larger body size. In the fall you may be able to



Two holes in the top of this ant house have sponge bits under them. One is for water, the other for honey. Put your ants in the third hole.

get a few winged ants (males and females) that will help to maintain your colony.

When you get home, dump your jar onto a sheet of newspaper out-of-doors, then put ants and soil into your glass container until it is about three-quarters full. Put the fourth stick in place and your ant house is nearly complete. Cover the glass sides with black paper so it is dark inside for the animals. To see them you can lift the dark paper occasionally. Each day put a drop or two of water on one of the sponges. On the other put a drop or two of honey and water mixture. Dead houseflies and tiny bits of meat can be put into the screened hole for additional food. With such an ant house, children can observe many of the stages in the development of an ant, and try some experiments with them.

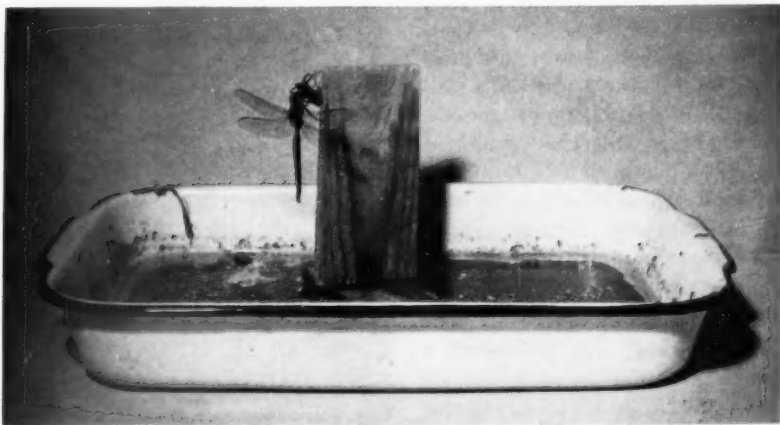
Some experiments that can be done with ants involve their sight, sense of smell, and other senses such

as touch. Try raising two different kinds of ants in adjacent ant houses. When their colonies are well established, take an ant from one colony and introduce it into the other colony. What happens? Try a black ant or two in a colony of red ants, then several red ants in a colony of black ones. Does one kind seem to dominate the other?

Cover one side of the ant house with strips of different colored cellophane. Try a vertical blue strip, a red one, a yellow one, and a green one. Also cover part of it with black paper. Can you observe any changes in the habits of the ants as a result of exposing them to different colored lights? Do some avoid the yellow, or the red, or the blue-lighted parts of the ant house? Can you think of other experiments to perform with the animals you raise in your classroom?

Besides land insects, many aquatic insects can easily be kept in the classroom over the winter. Dragonfly nymphs can be captured in early autumn, placed in shallow aquaria, and fed mealworms, earthworms, dead houseflies, bits of meat, and other animal material. It is best to keep some coarse vegetation or a few stones in the shallow pan or the glass aquarium under which these insects can hide. They may cling for hours to the underside of a stone until food swims by or is offered to them. Do not try to keep your dragonfly nymphs in an aquarium with tropical fish, however, or the dragonfly nymph may capture and eat many of the fish.

The gills of the dragonfly nymph are inside its abdomen, so to breathe it must take water into its abdomen, pass it over the gills, then squirt it out again. In doing this it makes



A dragonfly nymph lived for several months in this pan of water, then emerged as a winged adult.

tiny jets of water from the tip of its abdomen as it breathes. When it wishes to go forward in a hurry, it empties its abdomen of water quickly and shoots forward like a tiny aquatic jet. If you put a drop of ink directly behind the tail of one of these nymphs you may see it swirl the ink as it breathes or shoots forward. This action shows up best when the creature is placed in a small container or water such as a Petri dish or a saucer.

In the spring, when the dragonfly nymph shows signs of climbing out of the water, or of becoming uneasy, be sure to place a tall stick in the water so it can climb out and shed its pupal skin. Then your class may be lucky enough to see the adult dragonfly emerge. This process takes place in a few minutes, and, like butterflies or moths emerging, is one of the most wonderful in nature.

When you keep dragonfly nymphs in your classroom, be sure to let the children watch the action of its lower lip as it thrusts it out to seize food. Perhaps you can include a damselfly nymph (closely related, and with similar mouthparts) with its external gills for comparison. Just as the damselfly nymph is more slender and dainty by comparison, so is the adult. Perhaps your class can write and have published a picture story of a dragonfly nymph—its habit, its food, its emergence from its pupal case.

Adult dragonflies should not be



A wide-mouth gallon jar makes a satisfactory container for both collecting and keeping small aquatic animals.

kept in a classroom more than a day or two to let the children observe its big eyes, its *harmless* tail, and its gauzy, strong wings. Then it should be released to fly in the sunshine where it catches mosquitoes, flies, and other obnoxious insects.

Caddis worms, water beetles of various kinds, mayflies, water scorpions, and many other kinds of insects can be easily kept in a classroom aquarium. If you do not have a large aquarium, try keeping these animals in separate shallow pans. These enamelled pans can be purchased in many five-and-ten or hardware stores for less than a dollar. They make good trays for chemical experiments as well as for aquaria. When you add water to the aquaria, try to add fresh pond water, not tap water. Sometimes tap water contains enough chlorine to injure the aquatic animals you are trying to study.

Other land insects that you can keep in a classroom include the praying mantis, the ground beetles, and the ant lion. Many of these can be kept in a terrarium containing moist (not wet!) soil, a few plants, and some cover for the creatures to hide under during the day. A flat stone, or even a piece of tree bark makes a good hideout for most small animals. At night they may forage around the terrarium for bits of food that may have been dropped in during the day.

Remember that almost any insect can be kept for short periods of time in the classroom. All you need is a suitable cage, usually only a small one or a pan of water, and a place for them to hide and eat. Oc-

asionally one of your insects may disappear, but remember that many can fly (even whirligig beetles!), and some may be food for other insects in your cages. As a group, however, insects present more interesting habits for study than any other group of animals. Once you start keeping some of them you will find it both easy and fascinating. When you learn of unusual or especially interesting insects that your class has kept, let them write a story, preferably a picture-story, and send it to the Leaflet Office, Stone Hall, Cornell University, Ithaca, New York. The editor of the Leaflet may be able to include the story in a future number of Leaflet.



Mosquito wigglers will eat, pupate and emerge as adults—all in a pint jar covered with gauze.

EARTHWORMS

Earthworms in the classroom can provide some interesting studies as well as food for certain snakes, turtles, fish, and even small salamanders. Earthworms can be raised throughout the year in a wooden box filled with a mixture of dark, loose soil and leaves. Put about an inch of leaf mold in the bottom of the box, then an inch of loamy soil, another inch of leaves, another inch of soil, and so on until the box is about two-thirds full. Cover this with a layer of corrugated cardboard that is kept moist, not soggy. As long as you keep this box in a cool, dark place, the earthworms will thrive. Perhaps a corner of the



Moist paper on top of the leaf mold supplies sufficient water for the earthworms in this wooden container.

school basement would be a good place. The wooden box will stay damp, so it is a good idea to place a metal tray underneath it unless the floor is a concrete one. Every few days sprinkle a little water over the box and the cardboard.

The food of the earthworms will be mostly the leaves in the box, but you can place a little sour cream, coffee grounds, and even a few apple peelings under the cardboard for additional food. Do not overstock your box, or the extra food will spoil. Leaves alone are good worm food and will last a long time.

Along with the box of worms that you keep in the classroom or in the school basement, it is a good idea to keep a leaf pile near the edge of the school property. A pile two feet high and several feet long will harbor a large number of earthworms to use in study or as food for other animals. The leaf pile is even better when kept in a shallow pit. A pit four feet long,

two feet wide and a foot or more deep will supply earthworms for many months, and will keep them in good condition throughout the winter.

SNAILS

Snails of two general types can be kept in the classroom. One is an aquatic snail, of which there are many species. The other is the land snail, of which you will find fewer species.

Some aquatic snails have lungs; others have gills. Those that have lungs are more common than the gilled forms. They can be found moving upside-down on the surface of the water crawling along twigs and water plants, or on the bottom of ponds and streams. Gilled snails usually have an operculum, a hinged cover that closes up the opening in the shell when they are taken from the water. This operculum keeps them from drying out, and keeps the gills moist so that they can function again when the animal is returned to the water.

Aquatic snails need only a jar, a pan of water, or an aquarium in which to live. They will feed on algae or other plants, and on the organic material that drops to the bottom of the container. They lay their eggs in jelly-like masses glued to the side of the container, or to objects in the water. Inside each jelly-like mass you can see from a few to a dozen or more tiny snails developing. Let the children ex-

amine these masses to see the tiny coiled shells of the baby snails.

Land snails can be kept in a terrarium, or in a quart jar containing an inch or so of soil, some moss, and some bits of lettuce or cabbage leaves for food. A large terrarium will house several land snails. These animals are mostly nocturnal, hiding by day and feeding at night. By covering one with a dark container, or by putting one in a drawer, you may be able to make it come out to feed so the class can see it.

The eggs of land snails look like tapioca and are laid singly or in small clumps under partially decayed wood, or under stones. At least one land snail bears its young alive. Both the aquatic and the land snails are easy to keep and well worth study. Let the children look for such things as the stalked eyes—the longer of the two kinds of stalks in the land forms, and the only ones in the aquatic forms. Let them see how the land and aquatic snails pull their eyes back in when they touch something, or when danger threatens. Notice how sensitive the shorter “feelers” of the land snails are to touch. Are they equally sensitive to nearby warm objects and cold ones?

Can the class see how the snail eats, using its file-like tongue to rasp its way into food? Try feeding a snail a slice of sweet apple. Can you watch it working its way into the sweet pulp?

Slugs are snails without shells.

They, too, can be kept in a terrarium like land snails. They may thrive on a diet of lettuce or cabbage leaves, and other green, leafy vegetables. They often forage at night leaving a trail of slime. Similar trails often can be seen glistening on the sidewalks the morning after a humid night.

SPIDERS

Many spiders can be kept in a simple cage in the classroom. Observing and feeding them will do much to rid children (and their teachers) of the fear that they may have learned early in their childhood. One of the most interesting spiders is the orange and black garden spider. This creature is common to roadsides, gardens and meadows. It spins an exquisite orb web, often making a definite, coarse, zig-zag structure in the center. It waits at one side of the web, out of sight, until an unwary fly buzzes into the web. Then the spider dashes out of hiding, trusses up its prey in a bundle of silk, and feeds on it at leisure.

A simple cage to contain one of these spiders can be made from a piece of window screen about 30 inches long and 10 inches wide, and two pizza tins from the five and ten. Roll the screen into a cylinder about 10 inches in diameter and 10 inches high. Fasten the seam with a stapler or with a piece of thin wire and set the cylinder on a pizza tin. Cover it with another tin. You can

hang this cage out of doors by means of a coathanger, too. Then the spider will be exposed to the humidity of its natural habitat.

Flies can be introduced into the cage by lifting the upper tin. If this seems to disturb the spider, cut a hole in the upper tin and cover the hole with a small piece of screen or metal. Then this door can be moved to admit food.

Watch how the pet spider captures flies, and how it weaves its web. Touch the radiating lines of the web with a pencil point. Are they sticky? Touch the spiral lines. Are they sticky? Does the spider seem to run along certain lines of the web in pursuing prey? How much can you learn about spiders from keeping one in a simple cage in your classroom?

Another spider that is interesting to observe is the jumping spider. These do not make webs, but ambush their prey by jumping on it when it comes by. Small jumping spiders are very common in the northeast. They can be kept in a terrarium with sticks, bark, stones, and a few leaves on the bottom. Jumping spiders found in the woods may be kept in a woodland terrarium that is more moist than the one just described. All sorts of small insects may be placed in the cage for food for the jumping spiders.

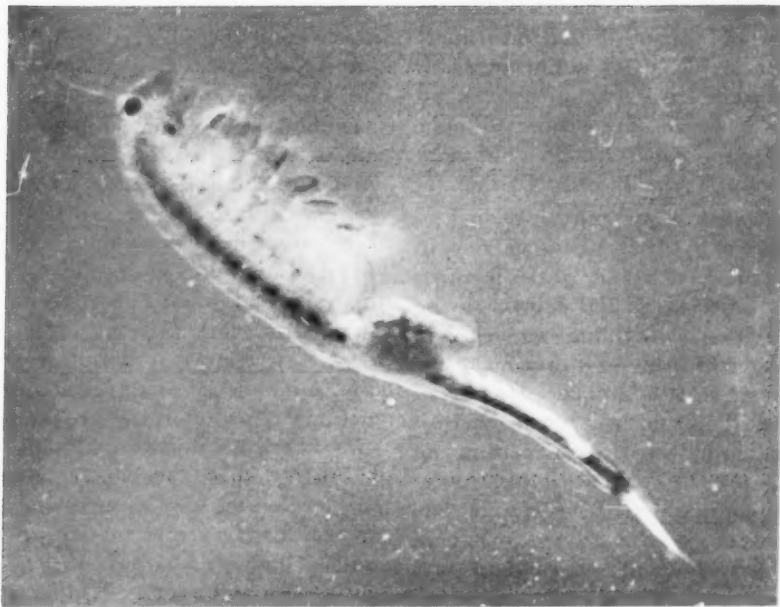
If you can find a female that is carrying an egg case (a round, white or cream colored ball at-

tached to her abdomen or carried with her legs), put her in a glass jar and cover it with cheesecloth. In a few days you may be lucky enough to see many tiny spiders emerge from the egg case. Small spiders are difficult to feed, so it is best to release them and let them forage for their tiny food by themselves.

The only native spider in the northeast that is dangerous to keep in a classroom is the black widow. You cannot find it in most parts of New York State and surrounding states, but even if one is located, it should not be kept in a classroom. It can be kept safely for months in a glass jar and fed houseflies and other soft-bodied insects, but there is always the danger of someone opening the cage "just to see what happens." To avoid accidents, do not keep dangerous animals. There are countless numbers of absolutely harmless ones that are equally interesting.

OTHER INVERTEBRATE ANIMALS

In addition to the animals described above, there are many small creatures that children should be allowed to keep and observe in order to learn about them. In late winter or early spring some ponds and roadside ditches will contain the exquisite, inch-long *fairy shrimp*. It swims on its back, propelled by the waving of its feathery legs. A very small aquarium, even a quart jar, will keep this animal



The fairy shrimp swims on its back while the egg sacs back of its legs flip from side to side. (About four times natural size)

for a while. Even in ponds, fairy shrimp do not live long, however, so do not be surprised if it dies soon after you collect it. In nature, it lays eggs and dies soon after becoming an adult. For months the eggs lie on the pond bottom. They hatch in the spring when the ice thaws and the ponds begin to warm. When keeping fairy shrimp overnight, put a jar of them in the refrigerator. They will keep much better in cool than in warm water.

Cyclops, a crustacean the size of a pinhead swims through the water in spurts. It is a common resident in shallow ponds and ditches. The females often have two egg-pouches

trailing from the rear. Wide-mouthed gallon jars make excellent aquaria for these animals. Filled with pond water, and with a number of water plants for protection and food, these creatures will thrive for some time with little care.

These tiny animals in a classroom aquarium can provide a basis for some interesting studies of health and geography. It might be pointed out to an upper-grade class, or to general science or biology students that these tiny animals harbor many parasites. Fish that feed upon them get the parasites. When people eat these fish uncooked, they, too, may get the parasites. In the

Far East one of these crustaceans harbors a parasite that may infect persons who drink unfiltered water. In some Eastern countries it is difficult to get the people to pour drinking water through a fine cloth to remove the infected *Cyclops*.

Hydra is an animal related to the corals. It is fairly common in warm-water ponds where it clings to water weeds and debris, waving its nearly invisible tentacles in search of food. As with many of the small aquatic animals, *Hydra* can best be kept in a large-mouthed gallon jar for both observation and raising. At first *Hydra* may appear as nothing at all. It may retreat into a little glob of jelly-like material nearly as small as a pinhead or if left undisturbed, it may lengthen and stretch out its tentacles until it is nearly two inches long.

The food of *Hydra* consists of small aquatic animals—almost microscopic in many cases. To feed one, simply replenish the pond water in the gallon jar from time to time, siphoning off the old water. Each new bottle of pond water will provide many new animals for each *Hydra* to feed upon.

To observe these animals well, each child should have some in a smooth-sided quart jar. Let each child spend a few minutes of a science period just looking through a magnifier at the shapes and actions of the small animals within his jar. Such observation is sufficient motivation for further study.

Smaller animals than fairy shrimp, cyclops and hydra are of little interest to children unless they can see them under considerable magnification. If you have access to one or more microscopes, or can project a small object onto a screen, you may wish to raise several kinds of protozoa in your room. To do this, put a handful of dry hay in a quart jar of rainwater. Set the jar in a warm, dark place for a few days, then remove it for observation. A number of single-celled animals may show up in the jar, along with numerous microscopic multicellular animals. These creatures will feed on the hay, on each other, and on dissolved substances in the water. Gradually, bacteria will begin to destroy the culture. Odors result and the culture must be discarded. For several days, however, your class can look at a veritable zoo in the hay infusion.

One of the most common animals in hay infusions is *Paramecium*. This creature is a single-celled animal that swims rapidly this way and that, often rolling as it swims. There are many kinds of *Paramecium*, some of which you can see with a hand magnifier against a sheet of dark paper placed under a glass dish containing a few drops of water from the culture.

Another interesting animal appearing in hay infusions is *Vorticella*. This looks like a shallow flower vase with a stem that coils up, then shoots the "vase" out again

in a slightly different direction. Rows of microscopic hairs called cilia churn the water at the open end of *Vorticella*, sweeping in even tinier bits of food for the animal.

As you look at a hay infusion, you will be amazed at the variety of animal life that is locked up in dry hay, but comes to life when it is placed in water. Do not expect an equal amount of life from all hay, however. If one sample does

not yield a sufficient array of animal life, try samples from other places. You may even try a handful of leaves that have lain on the ground for some time, or a handful of dried grass from along a roadside ditch. If you wish to provide *living* material for your pupils, remember that almost anywhere you look there are some animals, big or small, that can be kept and studied in your classroom.

SOME HELPFUL BOOKS FOR TEACHERS AND CHILDREN

HUSSEY AND PESSINO, *COLLECTING COCOONS*, Thomas Y. Crowell Co., N.Y., 1953. 73 pages. Suggestions for collecting and caring for cocoons, and raising the caterpillars to adults are given in this how-to-do-it book. The latter half of the book helps in identifying cocoons. For teachers and intermediate readers.

TEALE, E. W., *THE JUNIOR BOOK OF INSECTS*, Dutton, N. Y., 1953. 250 pages. Here are many suggestions for studies of living insects, with instructions for collecting, rearing and studying them. It is not a guide for identification. For teachers and advanced readers.

BROWN, VINSON, *HOW TO MAKE A MINIATURE ZOO*, Little, Brown & Co., Boston, 1957. 204 pages. These suggestions for collecting and caging are useful for small animals, but somewhat impractical for larger animals. Directions are included for constructing cages, for feeding, and for handling of home and school animal pets.

SHUTTLEWORTH, DOROTHY, *EXPLORING NATURE WITH YOUR CHILD*, Greystone, N. Y., 1952. 441 pages. Much of the book is devoted to animals to look for, interesting facts about them, and how to collect and keep them at home (or in school). Suggestions are brief but useful. For teachers.

GREENBERG AND RASKIN, *HOME-MADE ZOO*, David McKay Co., N. Y., 1952. 245 pages. Tips on keeping small vertebrate animals include the construction of their cages, their food, and their care. For teachers.

MORGAN, ALFRED, AN AQUARIUM BOOK FOR BOYS AND GIRLS, *Scovener's Sons, N. Y., 1941*. Directions are given for setting up and stocking an aquarium with aquatic vertebrates; for keeping and raising tropical fish, amphibians and turtles. Upper grade readers and teachers.

HILLCOURT, WILLIAM, *FIELDBOOK OF NATURE ACTIVITIES*, *Putnam's Sons, N. Y., 1950*. 316 pages. This sourcebook of suggestions for studying animals both in and out of doors includes how to make cages, how to stock them, and how to care for the animals.

Mealworms can be purchased from:

General Biological Supply House, Inc., 8200 South Hoyne Avenue,
Chicago 20, Illinois

Quivera Specialties Company, 4204 West 21st Street, Topeka, Kansas

Keeping Animals in the Classroom is the first in the 1959-1960 Cornell Science Leaflet Series. Other titles to follow are:

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Spring: *Reptiles*

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